

WHAT IS CLAIMED IS:

1 1. A method for approximating a gradient, the gradient defining a nonlinear
2 transition from one color or gray level to another in an image where the rate of transition is
3 determined by the function $y = x^e$ where $e > 1$, the method comprising:

4 identifying an error tolerance;

5 selecting a starting point and a set point on a curve defined by the function;

6 defining a linear step from the start point to the set point;

7 calculating a maximum error between the linear step and the curve;

8 if the maximum error is less than or equal to the error tolerance,

9 approximating a portion of the gradient corresponding to the linear
10 step with the linear step,

11 if the maximum error is more than the error tolerance,

12 selecting a new set point on the curve closer to the starting point and
13 repeating the calculating step and error checking steps.

1 2. The method of claim 1, wherein the first set point selected is an end point of
2 the curve.

1 3. The method of claim 1, wherein the new set point selected is half the distance
2 between the set point and the starting point.

1 4. The method of claim 1, wherein the step of approximating the portion of the
2 gradient includes

3 determining if the set point is an end point for the curve;

4 if the set point is not an end point for the curve, setting the set point as a new starting
5 point and continuing the process including selecting a new set point;

6 else, ending the process and approximating the gradient using the defined linear steps.

1 5. The method of claim 1, wherein the new set point is selected using the
2 calculated maximum error.

1 6. The method of claim 1, wherein the new set point is selected as being a point
2 that corresponds to a linear step having a maximum error equal to the error tolerance.

1 7. The method of claim 1, further comprising
2 if the maximum error is less than the error tolerance,
3 before approximating a portion of the gradient, continuing to select new set
4 points on the curve beyond the first set point and repeating the calculating step until the
5 maximum error associated with a new set point is equal to the error tolerance or the new set
6 point is an ending point on the curve,
7 then approximating a portion of the gradient corresponding to the linear step
8 with the linear step.

1 8. The method of claim 1, further comprising
2 checking to determine if the set point is an end point of the curve,
3 if not, approximating a second portion of the gradient including
4 repeating the method with a previous set point as the starting point for a next
5 approximation.

1 9. The method of claim 1, where the error tolerance is a visual tolerance.

1 10. The method of claim 1, further comprising using Newton's Method to select a
2 set point on the curve to minimize the error between an approximation produced by the
3 method and the curve.

1 11. A method for approximating a gradient, the gradient defining a nonlinear
2 transition from one color or gray level to another in an image where the rate of transition is
3 determined by the function $y = x^e$ where $e > 1$, the method comprising:
4 identifying an error tolerance;
5 selecting an optimal number of set points on a curve defined by the function
6 including determining each set point by evaluating a maximum error between a line defined
7 by a pair of set points and a corresponding portion of the curve using the error tolerance; and
8 approximating the curve by a series of linear portions connecting the set
9 points.

1 12. A method for approximating a gradient, the gradient defining a nonlinear
2 transition from one color or gray level to another in an image where the rate of transition is
3 determined by the function $y = x^e$ where $e > 1$, the method comprising:

identifying an error tolerance;
 selecting an optimal number of linear stops on a curve defined by the function
 including
 using Newton's Method to recursively sub-divide the curve to find a next
 linear portion that approximates a corresponding portion of the curve within the error
 tolerance where each linear portion is defined by two linear stops, and
 locating subsequent linear stops until an end point of the curve is reached; and
 approximating the curve by a series of linear portions connecting the linear
 stops.

13. A computer program stored on a tangible medium for approximating a
 gradient, the gradient defining a nonlinear transition from one color or gray level to another
 in an image where the rate of transition is determined by the function $y = x^e$ where $e > 1$, the
 program including instructions to:

 identify an error tolerance;
 select a starting point and a set point on a curve defined by the function;
 define a linear step from the start point to the set point;
 calculate a maximum error between the linear step and the curve;
 if the maximum error is less than or equal to the error tolerance,
 approximate a portion of the gradient corresponding to the linear step
 with the linear step,
 if the maximum error is more than the error tolerance,
 select a new set point on the curve closer to the starting point and
 repeat the calculating step and error checking steps.

14. A computer program stored on a tangible medium for approximating a
 gradient, the gradient defining a nonlinear transition from one color or gray level to another
 in an image where the rate of transition is determined by the function $y = x^e$ where $e > 1$, the
 program including instructions to:
 identify an error tolerance;
 select an optimal number of set points on a curve defined by the function
 including determine each set point by evaluating a maximum error between a line defined by
 a pair of set points and a corresponding portion of the curve using the error tolerance; and

9 approximate the curve by a series of linear portions connecting the set points.

1 15. A computer program stored on a tangible medium for approximating a
2 gradient, the gradient defining a nonlinear transition from one color or gray level to another
3 in an image where the rate of transition is determined by the function $y = x^e$ where $e > 1$, the
4 program including instructions to:

5 identify an error tolerance;

6 select an optimal number of linear stops on a curve defined by the function including

7 use Newton's Method to recursively sub-divide the curve to find a next linear
8 portion that approximates a corresponding portion of the curve within the error

9 tolerance where each linear portion is defined by two linear stops, and

10 locate subsequent linear stops until an end point of the curve is reached; and

11 approximate the curve by a series of linear portions connecting the linear stops.